

EULER'S METHOD

This worksheet concerns the differential equation

$$y' = x + y^2$$

There is no good method to solve this equation by hand.

1. Use the GeoGebra direction field plotter (<https://www.geogebra.org/m/W7dAdgqc>) to plot a direction field. Increase the density of the slope field by pulling the **Density** slider all the way to the right.

- a) Use the **Input** box at the bottom to set $A = (-1, 1)$, then toggle on **Solution A**. Use this curve to estimate $y(0)$ where y is the solution to the IVP $y' = x + y^2$, $y(-1) = 1$.
- b) Use the **Input** box at the bottom to set $B = (-2, 1)$, then toggle on **Solution B**. Use this curve to estimate $y(0)$ where y is the solution to the IVP $y' = x + y^2$, $y(-2) = 1$.

2. Use Euler's method with the following step sizes to repeat the estimates for problem 1.

- a) $h = 0.5$. Do this by hand (share with a friend so you can split up the work).
- b) $h = 0.1$. Use a spreadsheet.
- c) $h = 0.025$. Use a spreadsheet.